Installation instructions

Dextra

AI-GC01-E Rev.4

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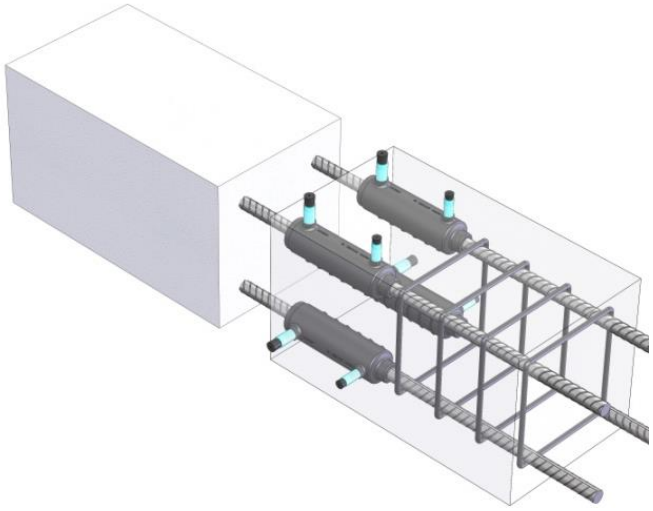
1. Overview

1.1 Introduction

Groutec is a mechanical splicing system with one threaded end specially designed for the connection of pre-cast concrete elements. Ribbed or deformed reinforcing bars of grades up to 550 MPa (80 ksi) can be spliced with Groutec.

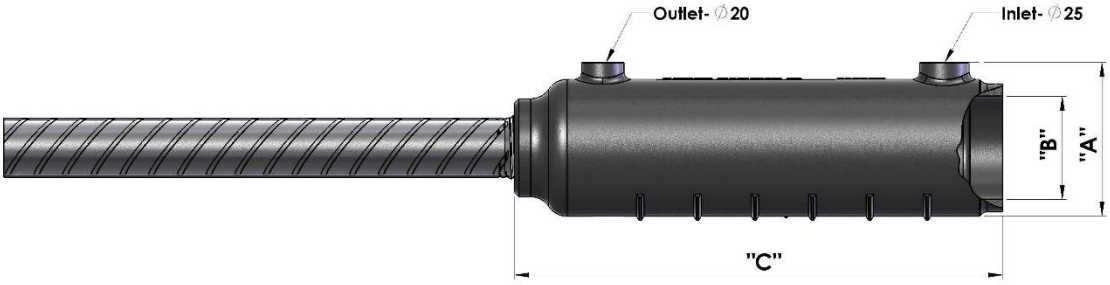
Splicing is usually done in two steps : The Groutec coupler is first screwed onto the reinforcement prepared at the precast factory, installed flush with the formwork, after which the element is concreted.

The connection is then completed at the construction site, where the precast element is positioned next to the adjacent element so that its protruding bars enter the cavities inside the Groutec couplers. The cavities are then filled with grout, either by gravity or by means of a grouting pump.



Groutec couplers have been designed to work with grouts commonly-available on the market place. Grouts must be non-shrink types, with a minimum compressive strength of 70 MPa. Groutec has been tested with grouts from major manufacturers such as Sika, Parex-Davco, Fosroc and BASF, which have a worldwide distribution network. However, attention is raised to the fact that such cement-based products are often produced locally from local raw materials, and that their properties vary depending not only on their origin, but also on climate conditions. For first-time users, we strongly recommend that prior tests be carried in order to confirm the suitability of the selected grout. Contact us at thailand@dextragroup.com for any assistance. Dextra's liability is in any case limited to the value of the couplers alone.

1.2 Coupler dimensions



Note : The diameters of the inlet & outlet holes are designed to fit with PE pipes (PE80/PN12.5) as per ISO 4427-2 and BS EN12201-2:2003 standards.

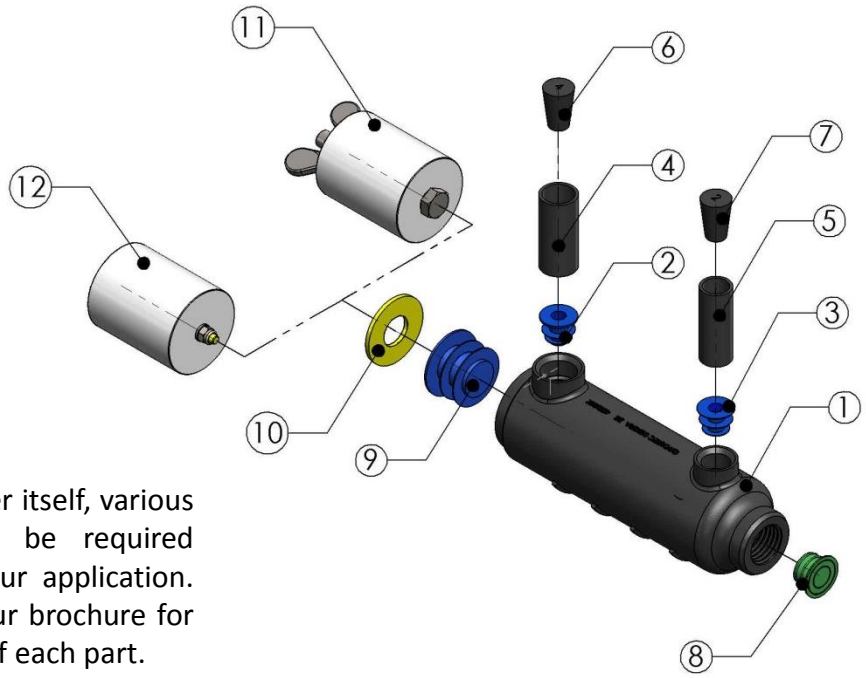
Standard splice – Both bars (Thread side and grout side) are of the same diameters.

Bar sizes mm	A mm	B mm	C mm
12	73	44	182
16	73	44	182
20	77	48	195
25	80	50	220
28	93	62	290
32	93	62	290
40	107	72	340

Transition splice – The bars on the thread side and on the grout side are of different diameters.

Bar size		A mm	B mm	C mm
Threaded bar mm	Grouted bar mm			
12	16	73	44	182
16	20	73	44	182
20	25	77	48	195
25	28	80	50	220
25	32	80	50	220
28	32	93	62	290
32	40	93	62	290

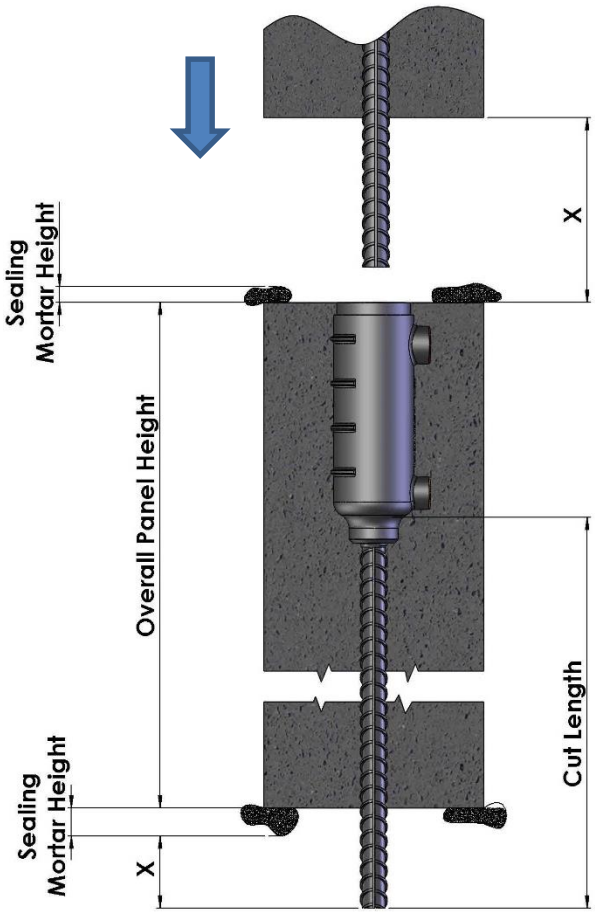
1.3 Accessories



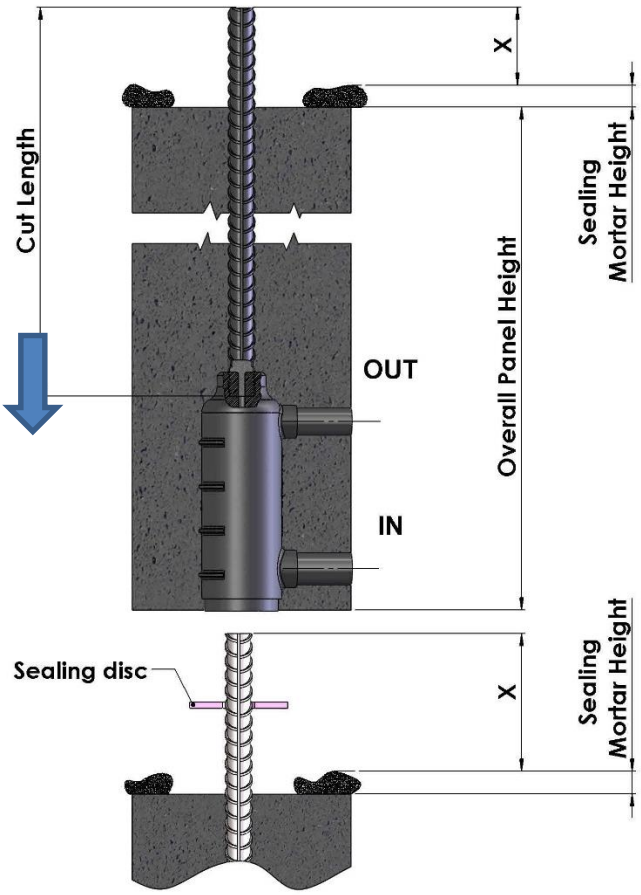
Beside the coupler itself, various accessories may be required depending on your application. Please refer to our brochure for the order codes of each part.

Item No.	Description	Standard scope of supply	Optional items available upon request
1	Groutec coupler	x	
2	Inlet plug	x	
3	Outlet plug	x	
4	Inlet pipe (OD 25mm)		x
5	Outlet pipe (OD 20mm)		x
6	Inlet pipe plug		x
7	Outlet pipe plug		x
8	Thread protection cap		x
9	Coupler protection cap	x	
10	Sealing disc		x
11	Groutec positioner (Screwed type)		x
12	Groutec positioner (Magnetic type)		x

1.4 How to determine the cutting length of the reinforcing bar ?

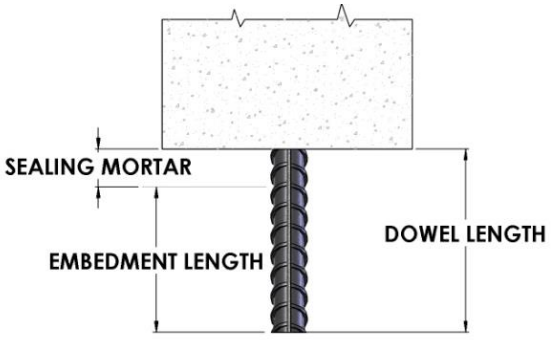


Gravity fill



Injection fill

Cutting length	Calculation
Maximum cut length	Overall panel height + Sealing mortar height
Minimum cut length	Maximum cut length - 1 Bar diameter
Dowel length	X + Sealing mortar height



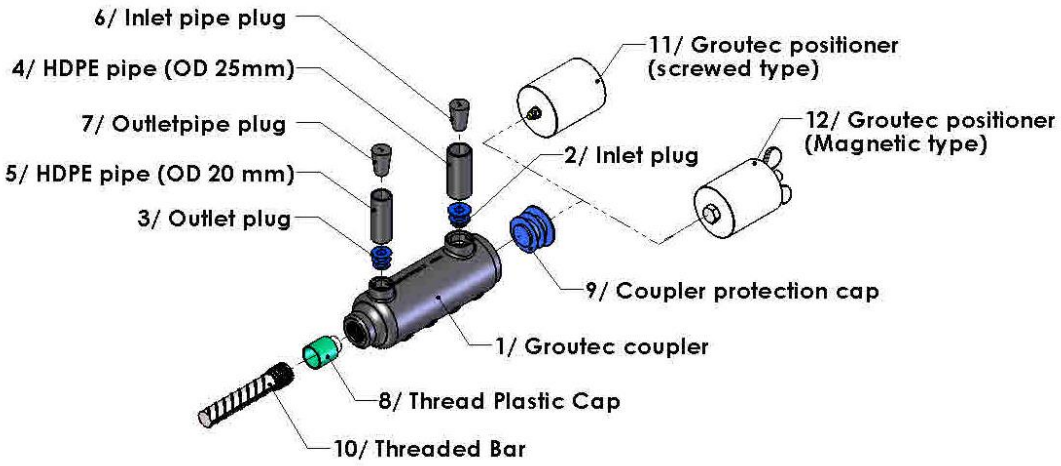
Standard splice

Bar sizes mm	Embedment length of rebar in Groutec couplers (mm)	
	Minimum	Maximum
12	143	155
16	145	155
20	150	160
25	165	180
28	225	240
32	225	240
40	270	285

Transition splice

Bar size		Rebar length on grout side	
Threaded bar mm	Grouted bar mm	Minimum mm	Maximum mm
12	16	110	155
16	20	120	155
20	25	130	160
25	28	160	180
25	32	160	180
28	32	225	240
32	40	230	240

2. Installation procedure at the precast factory



A. Connect the coupler to the bar:

1. Check from its marking that the coupler (#1) corresponds to the bar size.
2. Remove the thread plastic cap (#8) from the threaded bar (#10) if present.
3. Inspect the threads of both the bar (#10) and the coupler (#1). Clean any rust or dirt with a wire brush.
4. Screw the coupler (#1) onto the threaded bar (#10) until no thread remains visible.

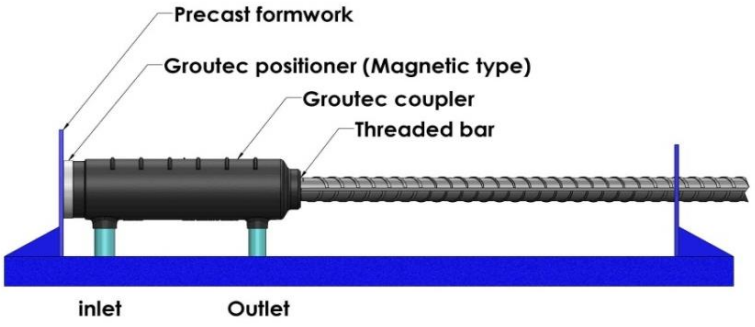
B. Position the reinforcement within the formwork:

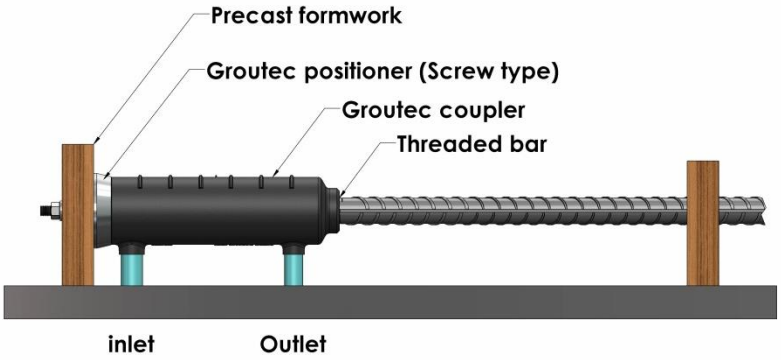
1. Make sure that the coupler protection cap (#9) is present and tight.
2. If a Groutec positioner (#11, #12) is used, install it to the formwork at the correct location.
3. Insert the coupler (#1) into the Groutec positioner (#11, #12). Two types of positioners are available: a screwed type for applications where it is acceptable to drill the formwork, and a magnetic type for other locations.
4. If no positioner (#11, #12) is used, make sure that the coupler protection cap (#9) is in contact with the formwork before securing the position of the reinforcement.
5. Turn the bar so that the coupler holes are facing the direction which will be used to inject the grout.

C. Install the inlet and outlet pipes:

If the couplers are intended to be gravity-filled, skip this chapter.

1. For each coupler, make sure that the inlet (#4) and outlet (#5) pipes have the proper length to reach the internal face of the formwork at the desired location.
2. Remove the plugs (#2, #3) and insert the pipes (#4, #5) into the coupler holes. A mallet may be used to make it easier. After insertion, it must not be possible to turn the pipes by hand.
3. Check that there is no gap between the pipes and their holes. Use any kind of sealant or glue to close any gap.
4. Close the opposite end of both pipes with a pipe plug (#6, #7) or adhesive tape.
5. Check that the pipe plugs (#6, #7) are tight enough so that they won't fall off during handling and are waterproof.





D. Casting of the concrete element :

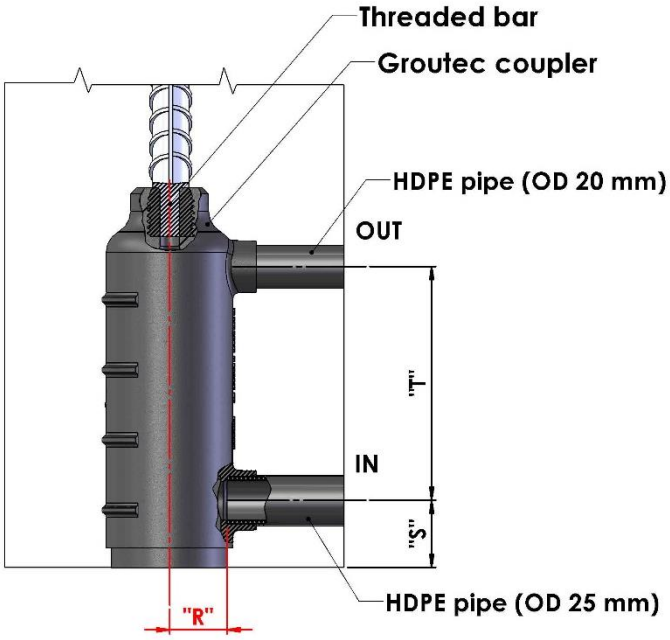
1. Close the formwork.
2. Check that the couplers (#1) are tightly fixed, so that vibration won't cause them to move.
3. Check that the couplers (#1) are orthogonal to the formwork and that no thread is visible between the coupler and the bar.
4. Check that the inlet and outlet pipes (#4 & #5) are facing the direction that is intended for their grout injection, that they are tightly fixed so that vibration won't cause them to move, and that there is no gap between them and the coupler that could allow cement paste to penetrate into the coupler.
5. Check that the coupler protection cap (#9) (or the Groutec positioner, #11 or #12) and the pipe plugs (#6, #7) are flush with the formwork, and that they are tight enough to prevent cement paste penetrating into the coupler.
6. Mark the location of all couplers (#1) and their inlet and outlet pipes (#4, #5) on the external face of the formwork.
7. Check the length of reinforcing bar that emerges from the formwork on the opposite side (taking into account the thickness of the formwork). Make sure it is within the minimum embedment length and maximum protrusion length specified on page 5.
8. Pour the concrete, making sure not to displace any inlet and outlet pipe (#4, #5).

E. Formwork removal :

1. Once the concrete is cured, remove the formwork and locate all couplers (#1) and their inlet and outlet pipes (#4,#5).
2. Remove the coupler protection caps (#9) and pipe plugs (#6, #7) and check that no cement paste has penetrated. Immediately clean any unwanted material by water. After inspection, put back all pipe plugs (#6, #7) or remove the pipes (#4, #5) altogether.

Preparing the injection and air vent pipes

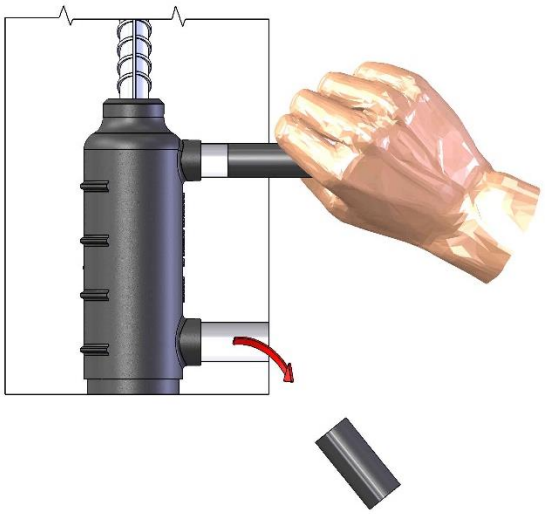
The Length of pipes = Distance from the internal face of the formwork to the center of Groutec coupler – “R” (Given in the table below);



Bar size	R mm	S mm	T mm
12	28	29	115
16	28	29	115
20	30	34.5	120
25	30	28.5	145
28,32	38	40	195
40	45	40.5	238

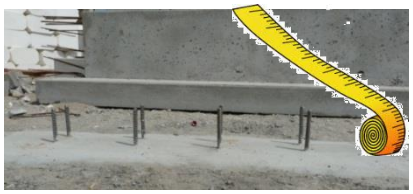
Case of removable pipes

In case the formwork can be drilled to let the pipes go through, letting them protrude at least 30cm out of the formwork may permit to pull them out after the concrete has set. The grout injection can then be done through the holes left in the concrete, but larger pipe plugs are then necessary.
Contact us at thailand@dextragroup.com for more information.



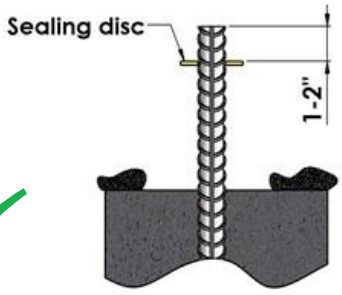
3. Installation procedure at the construction site

3.1a Vertical applications – by injection



A. Prepare the foundation/bottom element

1. Compare the dimensions of the foundation with the drawings. Make sure that any misalignment is within the tolerances allowed.
2. Check that the protruding lengths of the rebars are within the range given at chapter 1.2 of this document.
3. Clean the protruding bars of any cement or dirt.
4. Make sure that the surface of the foundation is clean. Sweep out any dust and residues.
5. Put the sealing discs over the top of the protruding rebars and push them down by 1”- 2” from the bar ends.



6. Ensure that the sealing discs are not in contact with the foundation before installation.

B. Install the top panel

1. Select the panel to install and check that the protruding lengths of its bars are also within the range given at chapter 1.2.
2. Lift the panel and position it on top of the foundation.
3. Check that the cavities inside the Groutec couplers are clean. (Rust is no problem) Clean them with compressed air if necessary.
4. Prepare the bedding mortar and place the shim plates on the top of the foundation as required.
5. Lower the panel down and check its verticality with a spirit level.
6. Once the bedding mortar has hardened, inject cement grout into the Groutec couplers.

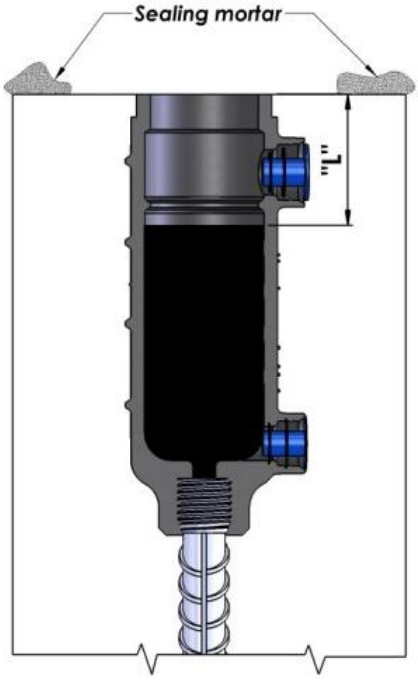
3.1b Vertical applications – by gravity

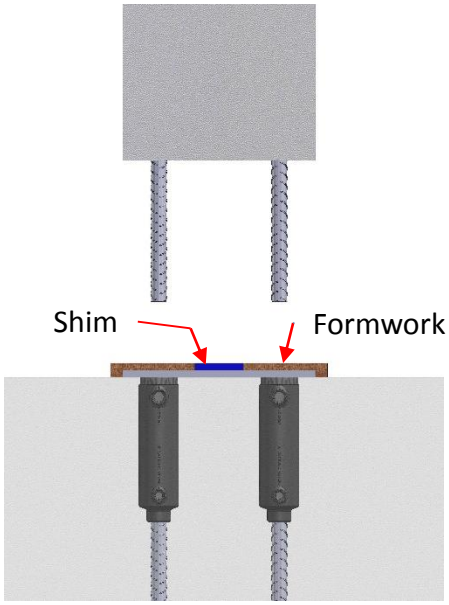
A. Prepare the foundation/bottom element

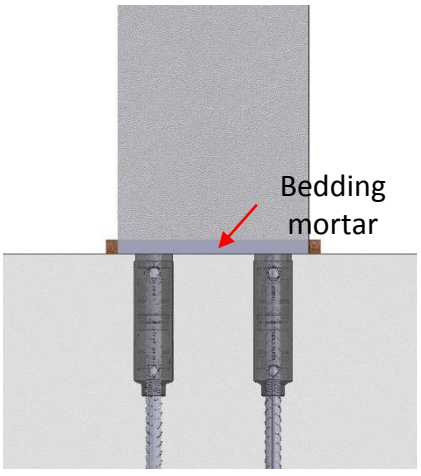
1. Compare the dimensions of the foundation with the drawings. Make sure that any misalignment is within the tolerances allowed.
2. Remove the protection caps from the Groutec couplers and check that the coupler cavities are clean. (Rust is no problem) Clean them with compressed air if necessary.
3. Make sure that the surface of the foundation is clean. Sweep out any dust and residues.

B. Install the top element

1. Select the top element to install and check that the protruding lengths of its bars are within the range given at chapter 1.2.
2. Lift the element and position it on top of the foundation.
3. Prepare the formwork around the grouting area.
4. Put the bedding mortar and place the shim plates on top of the foundation as required.
5. Pour the grout into the Groutec couplers, up to the level L shown in the table of page 11.
6. Lower the element down and check its verticality with a spirit level.
7. Clean the excess grout after installation.







Grout consumption

Standard splices –

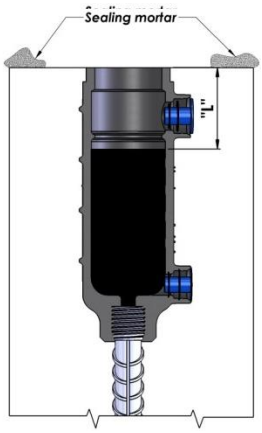
Bar size	Theoretical volume of grout required to fill a coupler (ml)	For gravity filling, maximum distance from top of sleeve “L” (mm)	Estimated qty of couplers per	
			25 kg/bag	30 kg/bag
12	270	15	45	55
16	250	25	48	58
20	400	25	30	37
25	500	35	25	30
28, 32	800	60	14	16
40	1275	60	8	10

Transition splices –

Rebar Size		Theoretical volume of grout required to fill a coupler (ml)	For gravity filling, maximum distance from top of sleeve " L" (mm)	Estimated quantity of couplers per	
Threaded bar	Grouted bar			25 kg/bag	30 kg/bag
12	**16**	246	20	49	61
16	**20**	222	30	54	68
20	**25**	286	40	42	52
25	**28**	287	70	42	52
25	**32**	224	90	54	67
28	**32**	755	60	16	20
32	**40**	1127	100	11	13

Remarks : These figures of grout consumption are theoretical computations of the cavity inside the coupler. For practical purpose they should be reduced by between 10% and 20% in order to take into account :

1) The volume used in the inlet and outlet pipes.
2) The volume used to join the two precast elements.
3) The volume that stays in the mixing tool.
4) The volume that stays in the injection tool.
5) Any other wastage.
6) The effect of climatic conditions (Ambient temperature, relative humidity, etc)
7) The actual bar embedment length.



3.2 Horizontal applications – by injection

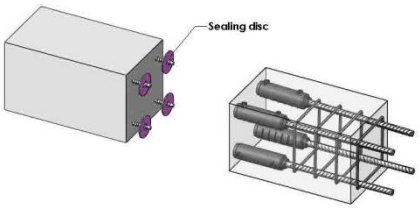
A. Prepare the precast elements

1. Compare the dimensions of the precast elements to the drawings. Make sure that any misalignment is within the tolerances allowed.
2. Check that the protruding lengths of the rebars are within the range given at chapter 1.2 of this document.
3. Check that the cavities inside the Groutec couplers are clean. (Rust is no problem) Clean them with compressed air if necessary.
4. Make sure that the surfaces of both elements are clean. Wipe out any dust and residues.

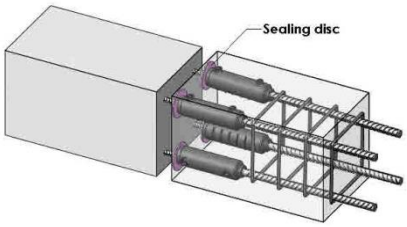
B. Install the sealing discs

1. Put the sealing discs over the top of the protruding rebars and push them down by 1”- 2” from the bar ends.
2. Make sure that the sealing discs are not in contact with the concrete face.

A



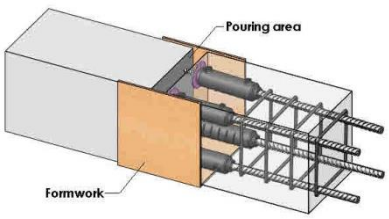
B



C. Connect the 2 elements

1. Lift the second concrete element and position it in front of the first element.
2. Move the sealing discs completely against the mouth of the Groutec couplers.
3. Push the second element to its final position against the first element.
4. Check the level and alignment of both elements.
5. Prepare the formwork around the grouting area.
6. Put bedding mortar to seal the gap between the two elements.
7. Once the bedding mortar has hardened, inject cement grout into the Groutec couplers.

C



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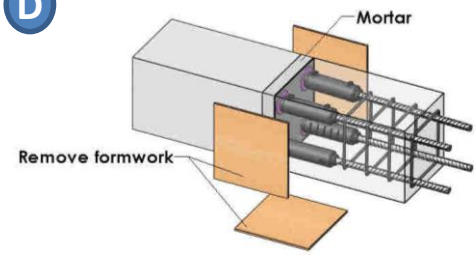


3.3 Grouting process

A. Mixing

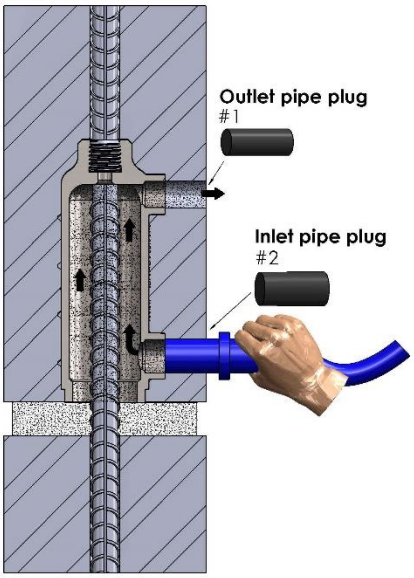
1. Make sure to strictly follow the work instructions provided by the grout manufacturer in the product datasheet and printed on the bag. Particularly, do not exceed the recommended water content. Always start with the median value of water content specified by the manufacturer.

2. Check the manufacturing date of grouts before use. Do not use bags that are past their expiry date.

3. Do not use bags that have previously been opened, or are damaged, unless they have been protected with a plastic stretch film to prevent contamination with moisture.

4. Use mixers with a speed of not over 500 rpm to avoid the creation of air bubbles inside the grout.

5. In parallel, prepare the cube specimens (around 6 - 12 at a time) and record the details such as date of preparation, testing date, batch no. of cement grout, water ratio, name or number of building, etc.



B. Grouting

1. Remove all residues from inside the coupler by water or air. In case you use water ensure that the couplers are dry before you start grouting .
2. Inject the cement grout by pump through the bottom hole (Inlet).
3. If the cement grout flows out from the top hole (Outlet), the inside of the coupler is completely filled.
4. Tightly close the top hole (Outlet) with a pipe plug. Then inject more grout during approx. 3 seconds. After that remove the injection valve and quickly close the bottom hole (Inlet).

C. Bracing

1. You must install the bracing equipment before grouting.
2. The fixing of the bracing equipment must be completed before the grouted cement has hardened.
3. You can remove the bracing equipment after 28 days which is when the cement grout has achieved the maximum strength.

Recommended non-shrink grouts

Manufacturer : SIKA.
www.sika.com

Grade : **SikaGrout 214**

Manufacturer : FOSROC.
www.fosroc.com

Grade : **Conbextra GP**

Manufacturer : PAREX-DAVCO.
www.parexdavco.com

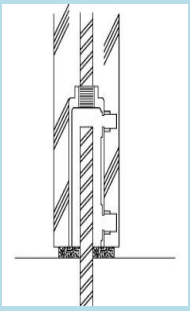
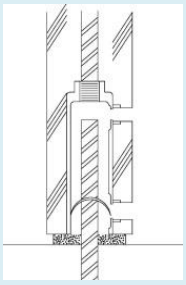
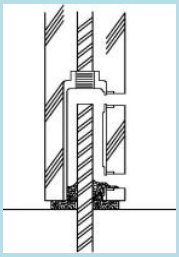
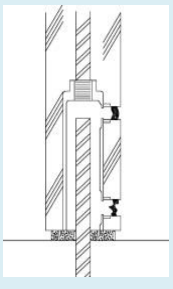
Grade : **Lanko 701**

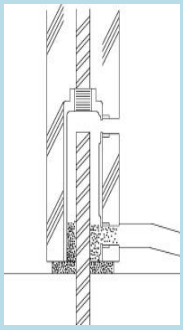
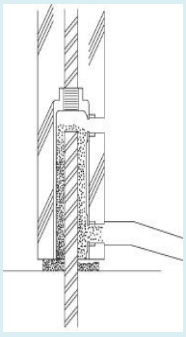
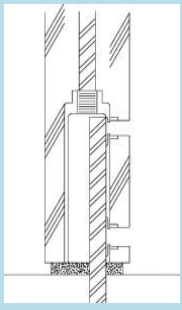
Manufacturer : BASF.
www.BASF.com

Grade : **MasterFlow 870**

Remark : Dextra is not the owner of the brands mentioned here. Any protected trademark rights remain entirely exclusive to their respective owners and are only mentioned here as a reference in relation to Dextra products. Please contact Dextra at thailand@dextragroup.com for more information on cement grout to be used with Groutec couplers.

4. Trouble shooting

Topic	Method	Picture
1/ Inlet and/or Outlet port(s) do not reach the surface.	1. Check and mark the position of the ports according to the drawings. 2. Chip out the concrete at the marked positions to find the embedded ports. 3. Blow out the ports with air compressors or water and confirm that there is a clear passage from the inlet to outlet port.	
2/ Due to dirt on the protruding rebar, the sealing disc gets stuck, slides into the coupler and reduces the gap of inlet port.	1. Try to clear the Inlet port by inserting a steel rod into it. 2. Follow step 3 of item 1.	
3/ The sealing disc was forgotten, and the bedding mortar from the joint clogs the Inlet port.	1. Try to clear the Inlet port by inserting a steel rod into it. 2. Follow step 3 of item 1.	
4/ Inlet and/or Outlet port(s) are clogged.	Due to debris etc.: Insert a steel rod into the port and hammer it to clean the port. Due to plugs: 1. Use a hooked rod to scrape plugs out of the ports. 2. Repeat step 3 of item 1.	

Topic	Method	Picture
5/ Leakage during pumping of grout through the joint due to incomplete grouting of the joint.	1. Seal the joint with polyurethane, mortar, etc. 2. Clean the inside of coupler with water. (Preferably high pressure). 3. Confirm a clear passage by blowing air through the ports. 4. Re-grout.	
6/ Clogging has occurred inside the coupler.	1. Clean the inside with high pressure water. 2. After confirm a clear passage by blowing air through the ports, start re-grouting at about half the speed of normal operation.	
7/ Protruding rebar is too close to the inlet and/or outlet port(s), restricting grout flow.	Insert e.g. a steel rod into the inlet or outlet port(s) and strike with sledge hammer to bend the rebar away from the ports and reduce restriction.	

Example of Inspection sheet

Inspection sheet					
Project		Temperature	Ambient		°C
Location			Dry grout		°C
Date of Grouting			Mixing water		°C
Date of inspection			mixed grout		°C
Report by		Grout cement	Brand		
			Model		
			Batch no.		
Approve by			MFG date		
			EXP date		

Coupler size	Q'ty/pcs.	Plan	Action	Balance	Remark

Dextra Manufacturing

Groutec Quality Assessment Form

Where did it occur?

Company name: _____
Problem observed & Reported by: _____
Project for which the production was done: _____

Details of Production Parameters

Bar used when the problem occurred:

Dia: _____ Grade: _____
Mill: _____

Threading parameter

Type of products ☐ Bartec ☐ Rolltec ☐ Griptec

Type of thread _____
Actual thread diameter _____ mm M_____ x _____pitch
(measuring by vernier caliper)

GO gauge ☐ Can go ☐ Can not go

NO GO gauge ☐ Can go ☐ Can not go

Grouting

Cement & Sample preparation

Brand of grout cement _____ Model _____
Batch no. _____ MFG date _____ EXP date _____
Mixing ratio: Grout cement _____ kgs Water _____ ml
Mixing times _____ mins Aging time _____ days
Temperature(Surface) _____ °C Temperature(Inside) _____ °C
Slump test diameter _____ mm

Water pH of water _____ Temperature _____ °C

Specimen Dimension _____ cm Aging time _____ days

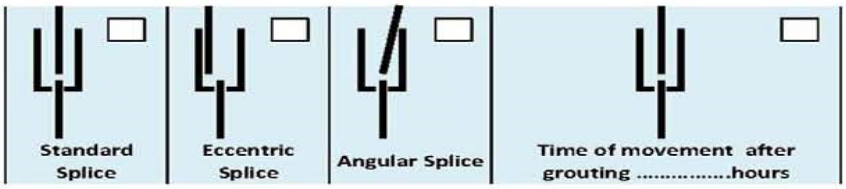
Storage Temperature _____ °C

Alignment For sample ☐ Alignment ☐ Mis-alignment

Filling method ☐ Gravity ☐ Injection

Tooling Mixer _____ rpm

Assembly conditions



Coupler on which the problem occurred:

Marking: _____
Box No. : _____

Packaging Information (Sampling vs Box label)

☐ All couplers marking numbers are recorded in the box lable
☐ Some couplers marking numbers are not recorded in the box label

Other information (if have) _____

Steel mechanical testing report

Total samples length: _____ meter
Who prepared the samples: _____

	Item	Yield Strength (MPa)	Tensile Strength (MPa)	Failure mode (tick the boxes)					
				Bar				Coupler	
				Thread cross		Thread pull out	Bar break	Cross section	Thread pull out
				Brittle	Ductite				
Control bar	-								
Groutec sample	1								
	2								
	3								

Please send back this form to

Attn: QA Manager
DEXTRA MANUFACTURING CO., LTD.
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RCC-081-A Issue 01